Firstly, Applicants acknowledge with appreciation the courtesy of Examiner Paik to conduct an interview on November 13, 2002 to discuss the outstanding issues in this case. In response to the interview, the claims have been amended to clarify that the ceramic heaters defined in Claims 1 and 2 are constituted to have a structure such that a convex body or a convex portion is formed on the surface of the ceramic substrate.

Support for the added subject matter in Claims 1-2 and for new Claims 15-26 is found in the specification on pages 2, 3, and 7 for Claims 1 and 2, page 2 for Claim 15, page 2 for Claim 16, page 12 for Claim 17, page 7 for Claim 18, page 13 for Claim 19, page 13 for Claim 20, pages 15 and 19 for Claim 21, page 12 for Claim 22, page 12 for Claim 23, page 12 for Claim 24, page 15 for Claim 25, and page 16 for Claim 26. Thus, no new matter has been added.

Amended Claims 1 and 2 define a ceramic heater having a ceramic substrate, on a surface of which or inside which, a heating element pattern is formed. The ceramic heater is constituted to have a structure such that a convex body or a convex portion is formed on the surface of the ceramic substrate and an object to be heated can be held apart from a surface of the ceramic substrate and heated.

Generally, thermal conductivity of a ceramic is lower than that of a metal. For example, the thermal conductivity of AlN is 180 W/m·K at the highest, but that thermal conductivity is still lower than the thermal conductivity of Al (236 W/m·K) or Cu (403 W/m·K). Therefore, on a heating surface to heat an object to be heated utilizing a ceramic substrate, the ceramic substrate has due to its lower thermal conductivity a high-temperature portion with a temperature distribution similar to the temperature distribution of the heating element pattern. Problems such as the uneven temperature distribution on the heater surface are not present on metallic heaters, since the metal in the metallic heaters have higher thermal

conductivities than the thermal conductivities of ceramics. Furthermore upon utilizing a ceramic substrate, the ceramic substrate can include a sintering aid and/or impurities. Thus, there is a possibility that an object to be heated will be contaminated, as disclosed in the specification.[2]

In the ceramic heater defined in Claims 1 and 2, a convex body or a convex portion is formed on the surface of ceramic substrate. With this structure, an object to be heated can be held apart from the heating surface of the ceramic substrate, so that it is not adversely affected by the uneven temperature distribution of the heating element pattern. Additionally, since a convex body or a convex portion structure establishes, for example, point contacts with the object to be heated, no contamination of the object to be heated by a sintering aid or other impurities contained in the ceramic substrate is detected.[3] Moreover, since a convex body or a convex portion is formed on the surface of the ceramic substrate, there is virtually no temperature difference between the ceramic heating surface and the convex body or the convex portion. Thus, an object to be heated is not partially cooled when it contacts with the convex body or the convex portion.

Accordingly, the ceramic heaters defined in Claims 1 and 2 address problems specific to ceramic heaters.

Kawanabe et al disclose a wafer holding member having a heating resistor embedded in a ceramic base body made of a mixture containing AlN and at least one of W, Mo, WC, TiC and TiN.[4] Heating resistor patterns are shown in Figures 7A and 7B of Kawanabe et al. According to Kawanabe et al, a wafer 30 is placed directly on the surface of the base body

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[2]Specification, page 27, see Comparative Example 1.

[3]Id., pages 27-28, see Test Examples 1-3.

[4]Kawanabe et al, see Abstract.

11, as clearly depicted in Figures 3 to 6. There is no disclosure or suggestion in Kawanabe et al that a wafer should be held apart from a surface of the base body. Accordingly, the ceramic heater of Kawanabe et al will likely have problems of contamination and uneven temperature distribution, i.e. problems solved by the present invention. Since there is no disclosure or suggestion in Kawanabe et al to hold a wafer apart from a surface of the base body, it is respectfully submitted that the ceramic heaters defined in Claims 1 and 2 are not obvious in view of Kawanabe et al alone.

Muka discloses a substrate heating apparatus in which a heat distribution plate 50 is preferably made of copper.[5] Considering the high thermal expansion of metals, a heating plate 36 located on the heat distribution plate 50 while not disclosed as metallic is most likely metallic. Regardless, the metallic heat distribution plate 50, owing to the high thermal conductivity of the metal especially the copper, will not produce an uneven temperature distribution on a top surface of the heating plate 36, even if the heating elements 34 are formed in a heating element pattern. Since the heating apparatus according to Muka is related to a metallic heater not a ceramic heater, the problem recognized, addressed, and solved by Applicants' claimed invention does not exist in Muka's heating apparatus. Thus, the technical base of Muka is different from that of the present invention. With no uneven temperature distribution present in Muka, Muka does not disclose or suggest utilizing the mounts 46 of the heating plate 36 of Muka to prevent uneven temperature distribution since there is no uneven temperature distribution problem on the heating plate 36 of Muka. Hence, Applicants submit that there is no suggestion or motivation for one in the art to apply the mounts 46 of the heating plate 36 of Muka to the ceramic heater of Kawanabe et al thereby to hold the object to be heated apart from ceramic heater of Kawanabe et al. Moreover, there is

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[5]Muka, column 2, lines 65-66.

no suggestion or motivation in Muka or Kawanabe et al for the claimed structure of a convex body or a convex portion formed on a surface of a heated ceramic substrate by which the object to heated can be held apart, as defined in Claims 1 and 2.

Therefore, it is respectfully submitted that amended Claims 1 and 2 patentably define over the applied prior art of Kawanabe et al and Muka.

Tamagawa et al disclose an electrostatic chuck which is heated to a high temperature.[6] However, the electrostatic chuck is not a heater and does not function as a heater. Rather, the electrostatic chuck in Tamagawa et al is used to cool a wafer heated by a plasma atmosphere. Specifically, Tamagawa et al disclose that the electrostatic chuck is used in a plasma atmosphere and is heated by the plasma atmosphere to high temperatures.[7] The wafer in Tamagawa et al is held apart from the surface 16a of the electrostatic chuck 10 at the tips of fine projections 28. Then, a cooling gas is introduced between the surface 16a and the wafer to cool the wafer uniformly.[8]

The electrostatic chuck in Tamagawa et al is used for cooling a wafer being heated by the plasma atmosphere. The problem recognized, addressed, and solved by Applicants' claimed invention does not exist in Tamagawa et al's electrostatic chuck apparatus. Thus, the technical base of Tamagawa et al is different from that of the present invention. Thus, it is impossible to find in Tamagawa et al the uneven temperature distribution problem caused by a heating element pattern formed in a ceramic heater, and impossible to find a suggestion or motivation in Tamagawa et al for one in the art to apply the cooling projections 28 of Tamagawa et al to the ceramic heater of Kawanabe et al thereby to hold the object to be

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[6]Tamagawa et al, column 3, lines 35-40.

[7]Id., column 9, lines 10-16.

[8]Id., column 5, line 60, to column 6, line 8.

heated apart from ceramic heater of Kawanabe et al. Moreover, there is no suggestion or motivation in Tamagawa et al or Kawanabe et al for the claimed structure of a convex body or a convex portion formed on a surface of a heated ceramic substrate by which the object to heated can held apart, as defined in Claims 1 and 2.

Therefore, it is respectfully submitted that amended Claims 1 and 2 patentably define over the applied prior art of Kawanabe et al and Tamagawa et al.

For all of the above reasons, it is respectfully requested that the 35 U.S.C. § 103(a) rejection over Kawanabe et al in view of Muka or Tamagawa et al be withdrawn.

Thus, it is respectfully submitted that independent Claims 1 and 2 and Claims 15-26 which depend therefrom are not obvious and patentably define over the applied prior art.

Consequently, in light of the present amendment and in view of the above discussions, the outstanding grounds for rejection are believed to have been overcome. This application as amended is believed to be in a condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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IN THE CLAIMS

Please amend the claims as shown below:

1. (Amended) A ceramic heater comprising:

a ceramic substrate, on a surface of which or inside which, a heating element pattern is formed,

wherein said ceramic heater is constituted to have a structure such that[:] a convex body or a convex portion is formed on the surface of said ceramic substrate, and

an object to be heated can be held apart from a surface of said ceramic substrate and heated.

2. (Amended) A ceramic heater comprising:

a ceramic substrate, on a surface of which or inside which, a heating element pattern is formed,

wherein said ceramic heater is constituted to have a structure such that[:] a face of said ceramic substrate on which no heating element is formed[,] or one face of said ceramic substrate is made to be a heating surface[;],

a convex body or a convex portion is formed on the surface of said ceramic substrate, and

an object to be heated can be held apart from said heating surface and heated.

Claims 3-14 (Canceled).

Claims 15-26 (New).